International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 03 | Mar-2016 www.irjet.net p-ISSN: 2395-0072

Survey On Distributed Computing Platform

Ajit Sul[1], Vishal Razdan[2], Satyendra Tiwari [3], Rupali Pashte[4]

[1]B.E Student, Dept. of Computer Engineering, PVPP College Of Engineering, Maharashtra, India
[2]B.E Student, Dept. of Computer Engineering, PVPP College Of Engineering, Maharashtra, India
[3]B.E Student, Dept. of Computer Engineering, PVPP College Of Engineering, Maharashtra, India
[4]Asst. Professor, Dept. of Computer Engineering, PVPP College Of Engineering, Maharashtra, India

---

Abstract - *The main goal of this paper is to extend our learning and application on already available systems for creating Distributed Computing Applications. Distributed Computing Platforms give programmers an opportunity to create applications that have overall execution time less than their counterparts. There are various systems present in the market that enable us to create applications running on distributed system such as BOINC, WCG (WORLD COMMUNITY GRID). These systems have certain limitations when used by small projects which can be overcome. Limitations like platform dependency, architecture complexity, and knowledge about the platform are very challenging for the programmers. These limitations don't play a very crucial role if dealing with the big projects but comes into picture if a project is small or medium sized. Hence throughout the paper we will discuss these systems and their limitations.*

Key Words: *platform, distributed, computing, application, small, projects, limitations*

1. INTRODUCTION

Distributed Computing is an environment in which a group of independent and geographically dispersed computer systems take part to solve a complex problem, each by solving a part of solution and then combining the result from all computers. These systems are loosely coupled systems coordinately working for a common goal. The main aim of distributed computing was to reduce the execution time of the program without affecting the complexity of the program. As the name suggests "Distributed Computing" provides a platform through which different modules of the program can be distributed over a network to different processors thereby simultaneously executing all the modules on the network. It can be defined as

1. A computing system in which services are provided by a pool of computers collaborating over a network.
2. A computing environment that may involve computers of differing architecture and data representation formats that share data and system resources.

Key design issues that must be considered while designing any distributed computing systems are

- **Transparency**

Overall system should look like a single coherent system to its user.

- **Scalability**

Distributed system must be able to cop up with increase in number of nodes.

- **Heterogeneity**

Distributed system should work with heterogeneous system i.e. it should be platform independent.

- **Fault – tolerance**

Failure of individual node must be taken care of.

- **Task scheduling**

Policy for distribution of task to individual node should be selected so as to maximize the performance.

- **Security**

Due to involvement of networks, network security is one of the measure issues. Also, important data and other confidential things should not get revealed to the user of individual node.

Any Distributed system should take the above design issues in consideration.

2. EXISTING SYSTEMS

The concept of Distributed computing was introduced long ago and there are several systems that use this concept to provide a platform to create applications that will run on independent volunteer nodes. Some very powerful ones are BOINC and WCG.

2.1 BOINC (Berkeley Open Infrastructure for Network Computing)

The **Berkeley Open Infrastructure for Network Computing (BOINC)**, an open-source middleware system, supports volunteer and grid computing. BOINC (Berkeley Open Infrastructure for Network Computing) is a software

system that makes it easy for scientists to create and operate public-resource computing projects. It supports diverse applications, including those with large storage or communication requirements. PC owners can participate in multiple BOINC projects, and can specify how their resources are allocated among these projects.[2]

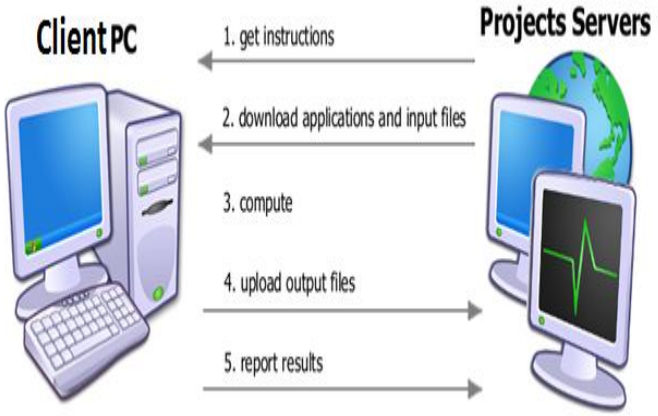
Goals of BOINC: -

- Reduce the barriers of entry to public-resource computing:- In order to provide a platform for the programmers with the help of which publicly available resources can be used by the program.[4]
- Share resources among autonomous projects: - Willing resources can be assigned to the projects.
- Support diverse applications: -BOINC accommodates a wide range of applications; it provides flexible and scalable mechanism for distributing data, and its scheduling algorithms intelligently match requirements with resources.[5]
- Reward participants: -The BOINC platform rewards its clients in order to attract participants. It assigns each participant with a score-credit in order to show how much they have contributed in the project.

Steps Followed By BOINC

- Subdividing long-running, variable-length analyses into short, fixed-length BOINC work units: We describe a scheme for subdividing long-running, variable-length analyses into short, and fixed-length BOINC work units using phylogenetic analyses as an example. Fixed-length work units decrease variance in analysis runtime, improve overall system throughput, and make boinc a more useful resource for analyses that require a relatively fast turnaround time, such as the phylogenetic analyses submitted by users of the garli web service at molecularevolution.org [1] (This web site provides web services for software commonly used in molecular evolutionary analyses, including **GARLI** and **GSI**. You can run these programs on our grid resources using the web services available on this site).

- Distributing The BOINC work units to different clients:-



Distributing Boinc work units to clients

1. Client PC gets a set of tasks from the project's **scheduling server**. The tasks depend on client PC: for example, the server won't give it tasks that require more RAM than client has. Projects can support several **applications**, and the server may send Client tasks from any of them.
2. Client PC downloads executable and input files from the project's **data server**. If the project releases new versions of its applications, the executable files are downloaded automatically to Client PC.
3. Client PC runs the application programs, producing output files.
4. Client PC uploads the output files to the data server.
5. Later (up to several days later, depending on preferences) Client PC reports the completed tasks to the scheduling server, and gets new tasks.

This cycle is repeated indefinitely. BOINC does this all automatically; clients don't have to do anything.

- All the result is merged at the server as per the merging logic and the output required from the project. Once result of all the modules is submitted to the servers, the output can be displayed to the end user or to the stakeholders as per their interests.

Limitations of BOINC

- Platform Dependent Architecture: BOINC has a platform dependent architecture. As the servers set up by BOINC for any project can run only on LINUX servers. The BOINC client has been ported to several platforms, but the BOINC server can only be executed on Linux-based operating systems.[3] It requires researchers to have experience with Linux system administration in order to create a new BOINC project.

- Complexity: The architecture of BOINC is very Complex. The researchers creating BOINC projects must learn the BOINC programming API and be proficient in Linux system administration, MySQL15 relational database administration, the Extensible

Mark-up Language (XML), and the C++ programming language.[4]

- Lack of Documentation: This is the biggest barrier faced by the programmers for developing BOINC project. There are also very few tools to facilitate the creation of new projects, resulting in a long, manual process.

- Not Suitable for small and medium sized projects: Due to large overhead task of understanding the BOINC architecture which makes it unsuitable to be used for small and medium size projects. The complexities of BOINC can be prohibitive factors for researchers interested in creating small to medium size Public Resource Computing projects.

- BOINC provides a Grid Computing platform which is not helpful in case of small and medium sized projects. As Grid Computing consumes resources which are not necessarily required for solving such small and medium sized problems.

2.2 WCG (World Community Grid)

World Community Grid (**WCG**) is an effort to create the world's largest public computing grid to tackle scientific research projects that benefit humanity. Launched on November 16, 2004, it is co-ordinate by IBM with client software currently available for Windows, Linux, Mac OS X, and Android operating systems. World Community Grid enables anyone with a computer, smart-phone or tablet to donate their unused computing power to advance cutting-edge scientific research on topics related to health, poverty and sustainability. Through the contributions of over 650,000 individuals and 460 organizations, World Community Grid has supported 26 research projects to date, including searches for more effective treatments for cancer, HIV/AIDS and neglected tropical diseases. Other projects are looking for low-cost water filtration systems and new materials for capturing solar energy efficiently. Through World Community Grid, many volunteers from all over the world provide computing power to advance leading research. Researchers are using world community grid for majorly tackling health problems. The computing power can be donated by all in the world. Even the smart phone like devices can donate its computing power for the projects. Using the idle time of computers around the world, World Community Grid's research projects have analyzed aspects the human genome, HIV, dengue, musculardystrophy, cancer, influenza, Ebola, virtual screening, rice crop yields, and clean energy. As of October 2014, the organization has partnered with 466 other companies and organizations to assist in its work, and has over 55,000 active registered users.[6]

The overall working of WGC is beyond the scope of this paper.

Limitations of WCG:
WCG also has similar limitations as that of the BOINC, except the platform dependency.

3. PROPOSED SYSTEM TO OVERCOME THE LIMITATIONS

System can be made for overcoming the limitations of BOINC. Following are the things that are needs to be taken care of while designing distributed computing platform:

- **For Overcoming platform dependent architecture: -** A system can be developed that can be executed on any platform. A system made in Java (platform independent) makes it possible to execute client/server programs on any platform thus making the system platform independent.
- **For Overcoming Complexity:** A system can be developed in which the server is always in a free state whereas the state of clients is maintained at client side only. This makes the architecture of the server very simple as the server does not have to remember anything about client except from maintaining the list of active clients present in the system. Due to which the whole architecture becomes simple.
- **Making System Suitable for small and medium sized projects:** Distributing the modules over local or metropolitan area network and not on wide area network makes it easy for the programmer. As the programmers have not to understand the architecture of the system and which makes easy for the programmers to use the system.
- **No Documentation Required:** As the architecture of the system is very simple, it is not necessary for the programmers to refer to the documentation of the designed system. Only the code needed for the formation of modules is needed to be written in the program.

4. CONCLUSIONS

Making server platform independent will facilitate us to provide platform independent distributed computing platform. Moreover platform dependency could be avoided making a good use of resources and providing a reliable platform for the programmers interested in small and medium size projects.

REFERENCES

[1] Adam L. Bazinet and Michael P. Cummings, Subdividing Long-Running, Variable-Length Analyses Into Short, Fixed-Length BOINC Workunits, Journal of Grid Computing DOI:10.1007/s10723-015-9348-5

[2] A. Acharya, G. Edjlali, and J. Saltz. "The Utility of Exploiting Idle Workstations for Parallel Computation". SIGMETRICS 97. Seattle, June 15-18 1997.

[3] Baldassari and James D, "Design and Evaluation of a Public Resource Computing Framework", Worcester Polytechnic Institute etd-042006-225855

[4] David P. Anderson. GRID '04 Proceedings of the 5th IEEE/ACM International Workshop on Grid Computing, 2004-11-08, IEEE Computer Society Washington, DC, USA ISBN: 0-7695-2256-4 doi:10.1109/GRID.2004.14

[5] BOINC: A System for Public-Resource Computing and Storage-David P. Anderson-Space Sciences Laboratory -University of California at BerkeLey

[6] en.wikipedia.org/wiki/World_Community_Grid

[7] www.worldcommunitygrid.org